



Atty. Dkt. No. REGIM 3.3-056

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Chartier et Al.
Title: Method of producing a ceramic article by means of pressure casting
Appl. No.: 10/534,845
International Filing Date: 10/12/2005
371(c) Date:
Examiner: THROWER, Larry W
Art Unit: 1791
Confirmation No.: 8898

DECLARATION UNDER 37 C.F.R. § 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Thierry, Jean, Emile CHARTIER, being duly warned, hereby declare and state:

1. I understand English when it is written.
2. I am graduated from National College for Engineering in Industrial Ceramics in Limoges (1982) and I received a Ph.D. degree in Materials Science from University of Limoges in 1985. I am currently employed as Research Director at the French National Center for Scientific Research (CNRS) where I have been employed since 1985. I have been conducting research and development in the field of ceramic processing for 24 years. I am the author/co-author of more than 100 reviewed papers.

3. I am a co-inventor of the invention disclosed and claimed in U.S. Patent Application No. 10/534,845, which is a National Phase application of PCT/FR2003/003379.

4. I have carefully reviewed the disclosures of the following references:

- ☐ U.S. Patent No. 5,972,263 to Goodman et al. ("Goodman")
- ☐ Canadian Patent No. 2,124,863 to Marple et al. ("Marple")

A person of ordinary skill in the field of casting ceramic parts reviewing Goodman concluded that Goodman discloses **traditional casting** of improved suspensions **without using solution** and that Marple discloses the production of graded properties parts by casting of mixtures of suspensions also **without using solution**. Both Goodman and Marple disclose casting of suspensions and do not use solution (organic compound dissolved in water) at any stage of their process, which differs from what is claimed in the current application. **A suspension containing ceramic particles (inorganic) is different of a solution (organic dissolved in water in our case).**

5. Goodman invention is aimed at improving the properties of kaolin based suspensions for **slip casting**. It is explicitly mentioned in this document that pressure casting, which is a fairly recent process with a high equipment cost is not considered because this process is limited to simple molds and that traditional plaster casting has still to be used for many items. Goodman discloses the modification of a slip for a conventional slip casting. Goodman uses the fact that a smectite with divalent ions (Ca^{2+}) disperses to a lesser degree than a smectite with monovalent ions (Na^+) because divalent cations compress more the electrostatic double layer (reduction of the Debye length) responsible of the repulsion between particles in comparison to monovalent cations. In this respect, Goodman hence teaches that it is beneficial to substitute divalent ions in the smectite by monovalent ions, by using a salt containing said monovalent ion.

The cited Goodman patent concerns i) traditional slip casting and not pressure casting as claimed in the current application and ii) casting of a suspension and not of a suspension followed by the filtration of a solution as claimed in the current application.

6. Marple discloses the production of parts with a gradient of material composition, then with graded properties, through the use of slip casting of mixtures of different slips, the percentage in volume of said different slips being controlled. Whereas it is cited that the process can be carried out under pressure, the essential feature of the process of the Marple's invention is the continuous flow of the slip or a mixture of slips through the mold from the inlet to the outlet of the mold at atmospheric pressure. **This document does not disclose nor suggest the use of solution.**

The application claims a two stage pressure casting process with the use of a solution in the second stage.

7. The application claims a method wherein the invention resides in a two stages process:

- a slip is cast under pressure, said slip not being fully deflocculated prior to the casting, which means that it contains agglomerates, resulting in pores of large dimensions and a rapid filtering, at the cost of reduced mechanical properties and a more difficult removal of the green part from the mold than for a deflocculated slip.
- a solution is filtered through the deposit, said solution containing deflocculant in order to deflocculate and break-down the agglomerates, which results in compacting the deposit, and conferring the resulting item better mechanical properties which enable the removal from the mold.

Differences between Goodman and Marple inventions:

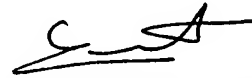
8. The current application is based on the fundamental understanding of interactions between particles in suspension. **The main mechanism, which is neither cited nor suggested in Goodman and Marple documents, is the subsequent two step pressure casting process with the innovative mechanism of pressure casting an under-deflocculated suspension of agglomerates (weak repulsive forces between particles) to**

rapidly form the cast, then in a second stage, to filter through this cast a solution of an organic deflocculant (and not a suspension which contains inorganic particles) to increase electrostatic repulsive forces between individual particles to allow the demolding of a consolidated cast. This two stages process using a solution in the second stage is neither disclosed nor suggested in Goodman and Marple documents US 5,972,263 and US 2,124,863.

9. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent resulting therefrom.

April 21, 2009

Date



Thierry, Jean, Emile CHARTIER